Gender differences in recovery from injuries to the extremities in older persons. A prospective study

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Accepted for publication: October 2002

Abstract

Purpose: This paper examines gender differences in trajectories of basic activities of daily living after fall-related injuries to the extremities in independently living older people in the Netherlands.

Method: The study comprised a prospective design. Data were collected from 31 men and 140 women at baseline, when they had not yet sustained injuries (hip fractures, other fractures or contortions and dislocations), and 8 weeks, 5 months and 12 months after their accident. Analysis of variance was used to test for differences in change in basic activities of daily living between baseline and follow-ups for men, for women and for the total study sample while adjusting for several covariates.

Results: The patients did not generally regain their pre-injury levels of functioning 12 months after the event. However, in contrast to the women, older men more closely reached their pre-injury levels of functioning. Although women deteriorated more than men, differences were not statistically significant at 8 weeks and 5 months post-injury. Long-term recovery, however, was significantly associated with gender when the impact of severity seemed to have expired.

Conclusions: Recovery of basic activities of daily living one year after injuries to the extremities seems to be influenced by gender. Female patients recovered less well compared to males. These gender-related changes warrant concern and attention in clinical practice.

Introduction

Community-based studies report that 23.1%–39.2% of those living independently, and 20%–44.9% of institutionalised elderly fall at least once a year. About 5% of falls result in fractures (1% in hip fractures) and 5% in other injuries. The short and longer-term consequences of non-fatal fall-injuries for individuals’ mobility and independence in Activities of Daily Living (ADL) are substantial. Only half of hip-fracture patients, for example, regain pre-event levels of mobility, and 33%–74% regain pre-event ADL-independence. In addition, the use of medical and informal care increases, as does the chance of becoming hospitalised or institutionalized.

Research on falls in the elderly has mainly focused on the prevalence of and risk factors for falls and fall-related fractures. Very little research, however, has been done on gender differences and recovery after fall-related injuries. Although several studies on predictors of functional recovery after hip fracture have included gender as a covariate, none of them were focused on the role of gender in recovery. Most of these studies reported no significant (multivariate) effects of gender on recovery in hip fracture patients except for Young et al. who found in a univariate analysis that male patients tended to have poorer functioning 6 months after their hip fracture. However, none of these studies was prospective, in the sense that disability and other covariates were assessed before the injury. Gender differences may have existed before the fall and may have continued afterwards. Furthermore, these studies all included only older hip fracture patients. And although Scaf-Klomp et al. prospectively studied the impact of eight different fall-related injuries on dependence in activities of daily living, they did not analyse gender differences.

The present paper studies whether men and women differ in regaining pre-injury levels of basic activities of
daily living (BADL) after a fall. A prospective design was used with a pre-injury baseline wave including the assessment of BADL and three post-injury waves assessing BADL. Instrumental activities of daily living (e.g., domestic activities, household chores) were excluded because they may be gender-related. The results of a previous study showed that the amount of social support received was associated with recovery after fall-related injuries. Next to age and social support, possible confounders measured at baseline were adjusted for: chronic medical morbidity and BADLs. In addition, the severity of the fall-related injuries and the length of the time interval between the baseline and the injury were adjusted for.

Methods

PROCEDURES

The persons evaluated in this study are participants in the Groningen Longitudinal Ageing Study (GLAS). GLAS is a population-based prospective and longitudinal study on the determinants of health-related quality of life of elderly people living independently in the north of the Netherlands, either in the community or in sheltered accommodations. Eligible were all patients aged 57 years and older from 27 general medical practices, which are linked to a local morbidity registration network (99% of non-institutionalized elderly in the Netherlands are registered with general medical practices). In 1993, 5279 subjects completed baseline assessments (62% of the eligible population) comprising an interview and a self-report questionnaire. Objectives, design and matters of representativeness of GLAS have been described earlier.

For this cohort study, general practitioners (GPs) reported patients who had sustained injuries to the extremities according to site, as coded by the International Classification of Primary Care (ICPC). Patients who had completed the baseline assessment were included until 31 December 1997 if their injury fell under the ICPC-codes L72 to L80 (fractures of wrist/forearm, ankle/lower leg, hand/foot and hip, contortions of ankle, knee or other contortions and dislocations). Follow-up interviews were conducted 8 weeks, and 5 and 12 months after the injury. The interviews were held at respondents’ homes by experienced middle-aged female interviewers. The interviewees did not know the interviewers in either a clinical or an administrative aspect. At the start of the interview, a shortened version of Folstein’s Mini-Mental State Examination (MMSE) was administered to evaluate respondents’ cognitive capacity to complete the assessment. A cut-off score of >4 was used to exclude people with serious cognitive disorders. If patients were too ill to complete the assessment at follow-up, proxy interviews regarding on aspects of subjects’ physical functioning were conducted with relatives or carers.

MEASURES

BADLs were assessed with the subscale from the Groningen Activity Restriction Scale (GARS) at baseline and at the three follow-ups. The GARS comprises 11 items referring to BADLs (wash face/hands, feed oneself, get around inside, get on/off toilet, get in/out bed, stand up from chair, dress oneself, wash/dry body, walk outdoors, go up/down stairs, take care of feet/toenails), with four response options per item. The results of previous studies showed that the GARS meets the stochastic cumulative scalability criteria of the Mokken Model, and can thus be considered one-dimensional. The scale theoretically ranges from 11 (no restriction) to 44 (maximum restriction). Recovery was expressed as the difference between the baseline sumscore and either one of the three post-injury scores (the latter was subtracted from the first).

Baseline levels of chronic medical morbidity, social support interactions, initial BADLs and age, as well as severity of the injury were included as covariates because they were found in previous studies to be associated with recovery after fall-related injuries. A checklist of 19 chronic medical conditions was administered to assess chronic medical conditions at baseline (see for detailed description Kempen et al.). In short: subjects were asked whether they had one or more chronic medical conditions out of a list of 19 conditions during the last 12 months before the interview. The number of chronic medical conditions was used as an index of chronic morbidity. Social support interactions were measured with the 12-item Social Support List (SSL 12-I). It reflects the extent of perceived social support received through social interactions with members of a person’s primary social network. Examples of the items are ‘Does it ever happen to you that people . . . drop in for a (pleasant) visit . . . comfort you . . . reassure you . . . emphasize your strong points?’ Scores on this 12-item scale theoretically ranges from 12 to 48; higher scores indicate more social support. A three-level index of the severity of the injury was constructed incorporating the ICPC codes used by the GPs. Hip fracture was considered the most severe. The second level comprised fractures other than hip fracture (fractures of wrist/forearm, ankle/lower leg and hand/foot). The third level consisted of non-fracture...
injuries (contortions of ankle, knee or other contortions and dislocations).

PARTICIPANTS AND RESPONSE

During the inclusion period, the GPs registered 287 patients who sustained injuries to the extremities. Of these, 18 did not meet the inclusion criteria, i.e. scored less than 5 (n=2) on short version MMSE, or were already enrolled in another GLAS cohort (n=16). Four people had died in the period between registration date and date of contact and five people could not be located. This brought the number of eligible patients to 260. Another 59 patients refused to participate, 22 because they felt too ill and 37 for other reasons. Proxy interviews were conducted on the functional status of 10 patients who were hospitalized at the time of the assessment or felt too ill otherwise. Valid data were obtained from 201 patients (including the proxies) in the first series of interviews (8 weeks post-injury); of these, 186 participated in the second series (5 months post-injury) and 181 in the third (12 months post-injury). Attrition of these 20 patients (n=201 versus n=181) was due to mortality (4 females and 1 male), refusal (9 females and 1 male), health problems (1 female and 1 male) or an unknown reason (2 females and 1 male). Ten patients (all females), who had participated in all three follow-up assessments, appeared to have incomplete baseline data for the GARS. Only those patients with complete data for the dependent variable at all four measurements were included in the analyses (n=171, response rate is 66% of 260 eligible patients—see above). Attrition in the present cohort study has been described elsewhere in detail.20, 21

ANALYSES

First, BADL mean scores and standard deviations at baseline and at the three follow ups (i.e. 8 weeks, 5 months and 12 months post-injury) were computed for men and women separately and for the total study sample. In addition, descriptive statistics according to gender were computed for all covariates. Second, paired t-tests were conducted to test for significance in changes over time within each gender category. Finally, changes in BADLs between baseline and 8 weeks, baseline and 5 months and baseline and 12 months were computed for men and women separately and for the total study sample. (Multivariate) analysis of variance was used to test for differences in change according to gender while adjusting for the influence of the selected covariates. The time interval between the start of the study and the fall-related injuries varied from immediately after the baseline to 57 months. The length of the time interval as an additional covariate is therefore included. For all analyses, p < 0.05 was considered statistically significant.

Results

The majority of patients (n=171) were female (81.9%); mean age for the sample was 70.3 years. Nearly 20% (n=34) of patients sustained hip fractures, nearly 60% (n=102) other fractures, and 20% (n=35) sustained contortions. For men, these percentages were 29, 45 and 26, and for women 18, 63 and 19, respectively. Table 1 shows the descriptive statistics of the study sample according to gender.

Table 2 shows the BADL mean scores and standard deviations for the four measurements in time for men and women separately and for the total sample. These results are graphically depicted in figure 1. At baseline, men and women had a similar level of difficulties with BADL, which increased significantly for both sexes at 8 weeks, 5 months and 12 months post-injury, except for men at 12 months post-injury.

Table 3 shows the changes in BADLs between baseline and 8 weeks post-injury, between baseline and 5 months post-injury and between baseline and 12 months post-injury for men, for women and for the total sample. Men approached their pre-injury level of BADL more closely than the women; the level of BADL among women deteriorated even after 5 months. The results indicate that gender seemed to influence recovery only

| Table 1 Descriptive statistics of study sample according to gender |
|-----------------------------|-----------------------------|
| Number of subjects          | Male | Female |
| Basic activities of daily living Mean ± SD | 23.0 ± 9.2 | 23.0 ± 7.3 |
| Age at baseline Mean ± SD    | 68.9 ± 6.9 | 70.6 ± 7.9 |
| Number of chronic medical conditions at baseline Mean ± SD | 1.2 ± 1.6 | 1.3 ± 1.2 |
| Social support interactions at baseline Mean ± SD | 25.8 ± 5.4 | 25.5 ± 4.6 |
| Time interval between baseline and injury in years Mean ± SD | 2.1 ± 1.3 | 2.0 ± 1.4 |
| Type of injury               |     |
| Hip fracture                 | 29%  | 18%    |
| Other fracture               | 45%  | 63%    |
| Non fracture                 | 26%  | 19%    |

Note: Higher scores indicate more difficulty with performing basic activities of daily living. Higher scores indicate more social support interactions.
in the longer run; on the short-term, gender was not significantly related to recovery. In addition, the change scores between 8 weeks post-injury and 12 months post-injury (2.0 for the total sample) were not statistically different for men and women (2.9 and 1.9, respectively) (data not shown in the table).

The results of the multivariate models showed furthermore (not in the table) that younger age was significantly associated with recovery at 5 and 12 months (p < 0.05) but not with short-term changes in BADLs. Severity of the injury (p < 0.05) was only significantly related to short-term changes in BADLs. In addition, the length of the time interval between the baseline and the injury was associated with recovery at 12 months (p < 0.05). The associations of all other covariates with recovery were not significant.

**Discussion**

This prospective study analysed the impact of gender on recovery from disability after injuries to the extremities in older persons. Several conclusions can be drawn. First, patients generally did not regain their pre-injury levels of functioning 12 months after their event. However, in contrast to the women, older men more closely reached their pre-injury levels of functioning. Second, short-term recovery seemed not to be influenced by gender. The impact of gender on recovery seems to start after 5 months. Third, the short-term changes in BADLs appeared to be determined by the severity of the injury (p < 0.05) while age (which may generally represent the amount of physiological reserve) as well as gender seemed to start their influence later on when the impact of severity had expired. And fourth, post-injury gender differences (between 8 weeks after the injury and 12 months after the injury) were not significant. This indicates that pre-injury level of functioning has to be taken into account.

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**Table 2** Mean scores and standard deviations for basic activities of daily living at baseline, at 8 weeks post-injury and at 5 and 12 months post-injury for males, for females and for total study sample

<table>
<thead>
<tr>
<th>Gender</th>
<th># Subjects</th>
<th>Baseline</th>
<th>8 weeks post-injury</th>
<th>5 months post-injury</th>
<th>12 months post-injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>pre-injury</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>13.0 ± 4.1</td>
<td>16.5 ± 5.4</td>
<td>14.5 ± 4.6</td>
<td>13.6 ± 4.7</td>
</tr>
<tr>
<td>Female</td>
<td>140</td>
<td>13.0 ± 3.4</td>
<td>18.4 ± 6.7</td>
<td>16.0 ± 5.9</td>
<td>16.5 ± 6.7</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>13.0 ± 3.5</td>
<td>18.0 ± 6.5</td>
<td>15.7 ± 5.7</td>
<td>16.0 ± 6.5</td>
</tr>
</tbody>
</table>

*Note: All mean differences between baseline scores on the one hand and 8 weeks, 5 months and 12 months post-injury scores on the other hand were statistically significant for males, for females and for the total sample (paired t-test, p < 0.05) except for baseline—12 months post-injury differences for males (p = 0.063). Higher scores indicate more difficulty with performing basic activities of daily living (BADLs)*

**Table 3** Mean scores and standard deviations for change in basic activities of daily living between baseline and 8 weeks and 5 and 12 months post-injury for males, for females and for total study sample

<table>
<thead>
<tr>
<th>Gender</th>
<th># Subjects</th>
<th>Baseline and 8 weeks post-injury Mean ± SD</th>
<th>Baseline and 5 months post-injury Mean ± SD</th>
<th>Baseline and 12 months post-injury Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31</td>
<td>3.5 ± 4.8</td>
<td>1.5 ± 2.4</td>
<td>0.6 ± 1.8</td>
</tr>
<tr>
<td>Female</td>
<td>140</td>
<td>5.4 ± 5.5</td>
<td>3.0 ± 4.4</td>
<td>3.5 ± 5.4</td>
</tr>
<tr>
<td>F-test</td>
<td>F = 4.2, n.s.</td>
<td>F = 1.2, n.s.</td>
<td>F = 6.7, p &lt; 0.05</td>
<td>F = 6.7, p &lt; 0.05</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>5.0 ± 5.4</td>
<td>2.7 ± 4.1</td>
<td>3.0 ± 5.1</td>
</tr>
</tbody>
</table>

*Note: Higher scores indicate more difficulty with performing basic activities of daily living (BADLs) at follow-up compared to baseline. Analysis of variance, main effect of gender adjusted for age and baseline levels of BADL, social support, number of chronic medical conditions, time interval between baseline and injury and severity of injury. Raw mean scores are presented.*
Several reasons for gender differences in functioning have been hypothesized. One hypothesis posits that the gender difference in functioning is due to women’s greater prevalence of nonfatal but disabling conditions and disease, such as arthritis and migraine headaches. The present study indicated that functional recovery after fall-related injury is affected by gender as well. Another hypothesis for observed gender differences in functioning is differential reporting of functional problems by men and women. However, a previous study showed that both men and women report their disability accurately, and that women’s higher prevalence of reported functional problems is probably a reflection of true disability. Third, besides higher incidences and prevalences of disability and medical conditions more generally, women report more psychological symptoms such as depressive feelings as well. The experience of fall-related injury may have induced depressive symptom, which may in turn affect recovery. The data of table 2 was re-analysed including depressive symptoms assessed with the Hospital Anxiety and Depression Scale (HADS) at 8 weeks post-injury. This did not diminish the significance of gender differences in recovery at 12 months (p < 0.05).

In a previous study with the same study sample, Scaif-Kloomp et al. found that next to hip fractures, wrist/forearm fractures in particular reduced patients’ chances of remaining independent; 43 out of 44 wrist fractures in our study were sustained by women. Although this result could have contributed to gender differences in recovery, an additional multivariate analysis excluding these 44 patients still yielded significant gender differences in recovery at 12 months (p < 0.05). In addition, the gender-specific changes in BADLs over 12 months were analysed within the three injury groups. In all three groups, female patients consistently deteriorated much more compared to the males: 5.4 for females versus 1.1 for males for hip fracture, 3.1 versus 1.1 for other fractures, and 2.9 versus −0.9 for non-fractures.

The prospective study included patients with fall-related injuries to the extremities, which occurred after the GLAS baseline assessment in 1993. The strength of this approach is that disability and chronic medical morbidity was assessed at baseline before the accident, which led to injury, took place. However, our approach also has limitations. First, the time interval between the start of the study and the fall-related injuries varied from immediately after the baseline to 57 months (mean: 2 years). Health status and disability may have changed during the interval, maybe explaining the difference found between men and women. Unfortunately, there is no data on these potential gender-related health changes. However, as shown in table 1, the length of the time interval was similar for men and women. Although the association between the time interval and recovery at 12 months was statistically significant, the inclusion of this covariate did not alter the results with respect to gender (data not shown). It is therefore assumed that variation in this interval did not substantially affect the outcomes of the study. Furthermore, a response rate of 66% is satisfactory for a cohort of elderly people who are followed for a comparatively long period (1993–1998); however, the 34% attrition may have affected the outcomes in one or another way. The unbalanced proportion of men and women in the sample does not so much refer to a bias in the sample as to a gender-bias in the population. Generally, women are known to be more at risk than men to sustain injuries after falls or other accidents. Finally, only a few covariates were included. It is not unreasonable, however, to hypothesize other gender-related variables which can affect recovery.

In conclusion, it was found that men seem to recover better from fall-related injuries 12 months after the event than women. This difference warrants concern and attention in clinical practice. However, due to the limitations of our study, this indication could be retested in future research comprising larger samples and other gender-related variables as covariates.

Acknowledgements

This research is part of the Groningen Aging Study (GLAS). GLAS is conducted by the Northern Centre for Healthcare Research (NCH) and various Departments of the University of Groningen in The Netherlands. The primary departments involved are Public Health and Health Psychology, Family Medicine, Psychiatry, Sociology (ICS) and Human Movement Sciences. GLAS and its substudies are financially supported by the Dutch government (through NESTOR), the University of Groningen, the Faculty of Medical Sciences, the Dutch Cancer Foundation (NKB/KWF), and the Netherlands Organization for Scientific Research (NWO). Preparation of this paper was supported by a grant from NWO, grant 904-54-562. The central office of GLAS is located at the NCH, PO Box 196, 9700 AD Groningen, The Netherlands (http://www.med.rug.nl/nch/).

References

G. I. J. M. Kempen et al.
